

February 24, 2004

MEMORANDUM TO: Mark P. Rubin, Section Chief  
Safety Program Section  
Probabilistic Safety Assessment Branch  
Division of Systems Safety and Analysis  
Office of Nuclear Reactor Regulation

Glenn B. Kelly, Sr. Reliability Risk Analyst  
Probabilistic Safety Assessment Branch  
Division of Systems Safety and Analysis  
Office of Nuclear Reactor Regulation

FROM: John W. Craig, Associate Director **/RA/**  
for Inspection and Programs  
Office of Nuclear Reactor Regulation

SUBJECT: NON-CONCURRENCE WITH THE COMMISSION PAPER ON  
10 CFR 50.46

This memorandum responds to your memorandum and note dated February 23, 2004, copies attached, which discussed your non-concurrence with the draft Commission paper. The Commission paper discusses and requests Commission direction on several policy issues to support the development of a proposed rule related to emergency core cooling large break loss of coolant accidents. The paper also discusses various technical issues related to such a rule.

The discussion of different views and comments is an essential aspect of fulfilling our safety mission. I want to recognize and thank you for your willingness to provide comments you believe are important for the consideration of the issues discussed in the paper. Your comments reflect a commitment to safety and a desire to support this important activity to further risk-inform NRC regulations.

I have considered the comments and conclude that the paper, as written, describes both the safety implications associated with revisions to 10 CFR 50.46, and the issues related to determining the frequency of loss of coolant break size. As we discussed, the comments, on balance, provide additional emphasis on items that are discussed in both the paper and the attachments, rather than identify significant issues which are not included in the paper. While your comments were not incorporated into the paper, they will be forwarded to the Commission along with this memorandum as an attachment to the paper.

If you have any questions, or would like to discuss this matter further please let me know. I appreciate your desire to ensure that the significance of these issues are understood and your support on the difficult task of revising these regulations. I look forward to your help in this effort.

Attachments:

As stated

cc: R. Borchardt

B. Sheron

February 23, 2004

NOTE TO: Brian W. Sheron, Associate Director  
Project Licensing and Technical Analysis  
Office of Nuclear Reactor Regulation

John W. Craig, Associate Director  
for Inspection and Programs  
Office of Nuclear Reactor Regulation

FROM: Mark. P. Rubin, Section Chief /RA/  
Safety Program Section  
Probabilistic Safety Assessment Branch  
Division of Systems Safety and Analysis  
Office of Nuclear Reactor Regulation

SUBJECT: NON-CONCURRENCE IN SECY ON POLICY DIRECTION FOR RESOLUTION  
OF TECHNICAL ISSUES ASSOCIATED WITH PROPOSED RULEMAKING TO  
RISK-INFORM REQUIREMENTS RELATED TO EMERGENCY CORE  
COOLING LARGE BREAK LOSS-OF-COOLANT ACCIDENT (LBLOCA) BREAK  
SIZE

I have not concurred on the above referenced Commission Paper associated with the LBLOCA redefinition. While I am very much in favor of the ongoing activity to risk-inform the LBLOCA definition and was one of the principle authors of the Commission Paper, late changes to some sections of the proposed Commission Paper reduced or eliminated insights that the technical staff had developed related to the potentially significant impacts on plant safety from the redefinition, if several technical challenges are not overcome. I believe that these insights should be available to the Commission for their consideration while preparing guidance to the staff for implementation of the redefined LBLOCA and associated 50.46 rulemaking.

I firmly believe that the redefinition of LBLOCA associated with the requirements of 10 CFR 50.46, can be successfully developed and implemented in a risk-informed manner that improves the effectiveness and efficiency of LBLOCA rule requirements. This is however, the first risk-informed initiative, that could potentially have significant impacts on plant mitigative capability for beyond design-basis accidents. Therefore, I recommend that the technical challenges be highlighted in a more direct manner than is done in the current version of the Commission Paper.

CONTACT: Mark Rubin, NRR\DSSA\SPSB  
415-3234

Specific changes that form the basis of my non-concurrence include:

Specific change 1:

*This paper seeks Commission direction on the scope and approach for the proposed rule on LOCA redefinition, so that the staff can develop the appropriate technical basis to support the rule, in light of the technical issues discussed in this paper. The paper also includes other areas in which additional policy guidance is being sought from the Commission (Attachment 1). With resolution of these technical issues, the staff concludes that a large break LOCA redefinition rule can be effectively implemented in a manner that maintains safety.*

Was changed to read:

*This paper seeks Commission direction on the scope and approach for the proposed rule on LOCA redefinition, so that the staff can develop the appropriate technical basis to support the rulemaking.*

The above change eliminates the insight that technical issue resolution is needed before a proposed LBLOCA rule can be developed that maintains safety.

Specific change 2:

*Through the staff's evaluation of the staff requirements memorandum (SRM) direction, possible rulemaking approaches, available technical information and stakeholder input, we have identified a number of technical issues that need to be resolved to ensure that the new rulemaking for LBLOCA redefinition does not result in an undesirable reduction in plant safety.*

Was changed to read:

*Through the staff's evaluation of the SRM direction, possible rulemaking approaches, available technical information and stakeholder input, we have identified a number of policy and technical issues that need to be resolved to ensure that the new rulemaking for LBLOCA redefinition does not result in unintended consequences.*

Characterizing the staff concern as one of "unintended consequences" greatly reduces the significance of the issues which were described as the potential for "~~undesirable reduction in plant safety~~," and again understates the importance of technical issue resolution before an adequate rule can be developed.

Specific change 3:

*Implementation of a redefinition of LBLOCA, ~~absent additional requirements or limitations~~, could result in unacceptable reductions in safety.*

B. Sheron  
J. Craig

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Was changed to read:

*Implementation of a redefinition of LBLOCA, is likely to result in changes to the plant with respect to response to large break LOCA that would also affect response to other initiating events, and thus to the overall risk of the plant.*

This change minimizes the potential for reductions in safety unless appropriate additional limitations and requirements are identified for the LBLOCA redefinition. Characterizing the issue as impact on “overall risk to the plant” understates the potential for safety impact.

cc: S. Black  
M. Johnson  
M. Tschiltz

February 23, 2004

MEMORANDUM TO: J. E. Dyer, Director  
Office of Nuclear Reactor Regulation

FROM: Glenn B. Kelly, Sr. Reliability Risk Analyst **/RA/**  
Probabilistic Safety Assessment Branch  
Division of Systems Safety Analysis  
Office of Nuclear Reactor Regulation

SUBJECT: NON-CONCURRENCE WITH THE COMMISSION PAPER ON RISK-  
INFORMING 10 CFR 50.46

First, I would like to provide you with my qualifications in the area of risk-informed regulation. I have a Masters degree in mathematics and a Masters degree in engineering. Prior to coming to the NRC, I math-modeled and programmed nuclear power plant simulators. I have been with the NRC since 1976. I have evaluated light water reactor core thermal hydraulics and liquid metal fast breeder reactors for the Analysis Branch, Chapter 15 emergency core cooling system (ECCS) analysis for the Reactor Systems Branch, control room and human factors analysis for the Human Factors Engineering Branch, multiple technical areas (including seismic, fire, equipment qualification, and source terms) for the Office of Policy Evaluation (at that time the technical arm of the Commissioners), and probabilistic risk assessments (PRAs) since 1981. As a PRA analyst, I have overseen the review or performed the review of five major PRAs including Millstone 3, Millstone 1, and the Advanced Boiling Water Reactor (ABWR). I was a principle author of Generic Letter 88-20, whereby all reactor licensees were compelled to perform internal and external event PRAs. I developed many of the security requirements in the Advisories and Orders for nuclear reactors and decommissioning plants following 9/11. I was a project manager for over three years. I also worked extensively on the risk-informing of 10 CFR 50.69 and completed the risk assessment aspects of the 10 CFR 50.44 rulemaking. I am one of the few staff members in the agency who has performed Chapter 15 analyses (i.e., understands a broad range of design bases events), performed preliminary safety analysis report (PSAR) and final safety analysis report (FSAR) reviews for nuclear power plants that operate today, understands PRAs, understands how the systems of a plant work together, and understands our regulations.

I am a principle author of this Commission Paper. I believe in the value of probabilistic risk assessment and risk-informing our regulations. I also believe that the precedent that this rule will set will affect how nuclear power plants are regulated in the future. I object to two last minute changes to the Commission Paper that removed words which alerted the Commissioners to the potential serious safety implications if too simplistic an approach were taken in developing the rule or if inadequate controls were placed on restricting plant changes.

CONTACT: Glenn Kelly, NRR\DSSA\SPSB  
415-1075

The first modification was made as follows:

Through the staff's evaluation of the SRM direction, possible rulemaking approaches, available technical information and stakeholder input, we have identified a number of policy and technical issues that need to be resolved to ensure that the new rulemaking for LBLOCA redefinition does not result in an undesirable reduction in plant safety unintended consequences.

The words "unintended consequences" do not convey the significance that "undesirable reduction in safety" does. Use of "unintended consequences" masks the seriousness of the modifications to our regulations we are contemplating. The following are examples of areas that could be affected by the rulemaking: containment ultimate pressure, equipment qualification, containment sump debris capabilities, removal of accumulators in PWRs, increase of core peaking factors, modification of containment spray and fan cooler system capabilities, modification of ultimate heat sink capabilities, increased power uprates, reduced refueling water storage tank (RWST) boron concentration, and modification of motor-operated valve (MOV) test requirements.

The second modification that I object to is the removal of any mention in the cover memo of the potential large uncertainty (and its consequences) in the results to be produced by the Expert Elicitation Process for determining the frequency of loss-of-coolant accident (LOCA) break sizes. Why is this uncertainty important? If the results of the elicitation conclude that large LOCAs are highly unlikely, then most or all large breaks will be excluded from the design-basis. Much of what is in the design-basis of nuclear power plants today is directly affected (e.g., loads, temperatures, and pressures to withstand; required flow rates to mitigate events) by the limiting design-basis accidents as evaluated in Chapter 15 of the FSAR. For many plants, the limiting design-basis event is a large break loss-of-coolant accident (LBLOCA). It is not clear to the staff yet what the level of uncertainty will be on the results reported out by the expert panel. No peer review within the staff or by anyone else has been scheduled at this time. While the panel will provide the most up-to-date estimate of LOCA frequencies available for large breaks, no data exist for break sizes in the region of interest. In addition, it is my understanding that probabilistic fracture mechanics calculations do not yet do a good job of replicating actual data from pipe breaks that have occurred. Never-the-less, the panel of experts has been asked to project frequency estimates for ranges of break flows, including both the median (i.e., 50% of the time the expert expects the frequency to be higher or lower) and the 95<sup>th</sup> percentile (i.e., 95% of the time the expert expects the frequency to be lower). These estimates do not result in the kind of statistical confidence that is attained in ECCS evaluations using 95% confidence that 95% of the time a fuel pin reaching this departure from nucleate boiling ratio (DNBR) will not depart from nucleate boiling. Today we have regulations that provide mitigation to large break LOCAs, and through their robustness provide severe accident mitigation capabilities, which are beyond the capabilities to which the plants were originally designed. In removing events from the design-basis, we must be careful to not remove too much of our severe accident mitigation capabilities.

When I discussed the issues raised by this Commission Paper with Bill Travers, he told me that this is as complicated and important an issue as any since the ECCS hearings in the 1970s, and perhaps is even more complicated. The risk-informing of 10 CFR 50.46 should be performed methodically, not performed in a rushed manner. When important aspects of the

rulemaking are done in parallel rather than in series (e.g., the expert elicitation and the development of the technical basis for the rulemaking), it is important to allow time to integrate the areas and consider the implications.

I believe that this Commission Paper, except for the two areas discussed above, does a good job of informing the Commission of the policy and technical issues that have been identified so far in the risk-informing of 10 CFR 50.46. When these two areas are rewritten to provide the Commission with an appropriate statement of the significance of the issues, I will wholeheartedly concur in the paper.

cc: B. Sheron  
J. Craig  
S. Black  
E. McKenna  
M. Johnson  
M. Tschiltz  
M. Rubin  
S. Dinsmore